Aerobic Treatment Units

Recommended Standards and Guidance for
Performance, Application, Design and Operation & Maintenance

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Office of Environmental Health and Safety

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Preface

The recommended standards contained in this document have been developed for statewide application. Regional differences may, however, result in application of this technology in a manner different than it is presented here. In some localities, greater allowances than those described here may reasonably be granted. In other localities, allowances that are provided for in this document may be restricted. In either setting, the local health officer has full authority in the application of this technology, consistent with Chapter 246-272 WAC and local jurisdictional rules. If any provision of these recommended standards is inconsistent with local jurisdictional rules, regulations, ordinances, policies, procedures, or practices, the local standards take precedence. Application of the recommended standards presented here is at the full discretion of the local health officer.

Local jurisdictional application of these recommended standards may be:

1) **Adopted as part of local rules, regulations or ordinances—**When the recommended standards, either as they are written or modified to more accurately reflect local conditions, are adopted as part of the local rules, their application is governed by local rule authority.

2) **Referred to as technical guidance in the application of the technology—**The recommended standards, either as they are written or modified to more accurately reflect local conditions, may be used locally as technical guidance.

Application of these recommended standards may occur in a manner that combines these two approaches. How these recommended standards are applied at the local jurisdictional level remains at the discretion of the local health officer and the local board of health.

The recommended standards presented here are provided in typical rule language to assist those local jurisdictions where adoption in local rules is the preferred option. Other information and guidance is presented in text boxes with a modified font style to easily distinguish it from the recommended standards.

Summary of Significant Changes – Effective December 31, 2003

Section 1.2.2. Product Testing This section specifies the required testing protocols for Category 1, 2, and 3 aerobic treatment units. This change is in accordance with the June 12, 2003 Technical Review Committee recommendation.

Section 2.1. Application Standards Table III has been added to better define the application requirements for Category 1, 2, and 3 aerobic treatment units. The change is in accordance with the June 12, 2003 Technical Review Committee recommendation.

Section 2.3. Interim allowance The interim allowance for the use of Category 1 ATUs on Category 2 sites has been removed. See Section 2.1. for Application Standards.

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- Sun-Mar Corporation
- Washington State On-Site Sewage Association (WOSSA)
- Washington State On-Site Sewage Treatment Technical Review Committee (TRC)
- Waste Water Technologies

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Introduction—

Aerobic treatment units (ATUs) provide aerobic biological decomposition of wastewater constituents by mechanically bringing the wastewater in contact with air. ATUs come in different configurations and sizes, and incorporate a variety of approaches, including air pumps, air injectors, lift pumps and biological-contact surfaces (such as pipes, fabric, grids, gravels, and rotating disks). Other alternative wastewater treatment technologies, such as sand filter systems, may also be described by this characterization, however they are not categorized by the Washington State Department of Health (DOH) as aerobic treatment units or systems.

ATUs are not stand-alone wastewater treatment systems, but provide wastewater treatment prior to disposal in a subsurface drainfield system or provide pre-treatment to other alternative methods of wastewater treatment and/or disposal.

1. Performance Standards—

1.1. Listing—

1.1.1. Before a local health jurisdiction may issue an installation permit for an on-site wastewater system incorporating an ATU, the brand and model must be included on the current DOH List of Approved Systems and Products (WAC 246-272-04001(2)).

1.1.2. The DOH reviews and lists proprietary products based upon the manufacturer-provided detailed information demonstrating that the ATU meets or exceeds the performance testing requirements defined in subsection 1.2 of this document.

1.1.3. The department lists proprietary ATUs in three categories:

(a) Category 1: ATUs designed to treat typical-strength residential wastewater;

(b) Category 2: ATUs designed to treat high-strength non-residential or commercial wastewater (such as at restaurants, grocery stores, mini-marts, group homes, medical clinics, etc.); and,

(c) Category 3: ATUs designed to treat high-strength residential wastewater (conditions of atypically high levels of BOD_5, TSS, or FOG).

Please Note: *Do not confuse these three designations (Category 1, 2, & 3)) with the NSF International classification of ATUs, Class I and Class II, or with DOH performance classification of Treatment Standard 1 & 2. They are all different designations. They are not used interchangeably.*

1.2. Performance Testing—

1.2.1. ATUs must be tested by an approved testing facility independent from the manufacturer.

1.2.2. Product Testing—

(a) Category 1 ATUs must be tested according to the product standards and testing protocol established by the National Sanitation Foundation in the NSF Standard No. 40 Residential Wastewater Treatment Systems, January 1999 or subsequent versions that may be published. The testing may be performed by the NSF or another

approved testing facility. On-going product certification and listing by NSF (or other entity) is not required.

(b) Category 2 and 3 ATUs must be tested according to EPA/NSF Protocol for the Verification of Wastewater Treatment Technologies / EPA Environmental Technology Verification (April 2001)The testing program, which must be approved by DOH, may be performed by NSF or another approved testing facility as provided in the EPA/NSF Protocol for the Verification of Wastewater Treatment Technologies / EPA Environmental Technology Verification (April 2001). On-going product certification and listing by NSF (or other entity) is not required.

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1.2.3. Product Performance—

(a) Category 1 ATU (designed to treat typical-strength residential wastewater) performance must be equal to, or better than, those specified and required by NSF for either NSF Class I or Class II certification. The performance criteria are summarized in Table I.

(b) Category 2 ATU (designed to treat high-strength non-residential or commercial wastewater) performance must provide an effluent quality equal to or less than 200 mg/l BOD_5, 125 mg/l TSS, and 25 mg/l FOG).

(c) Category 3 ATU (designed to treat high-strength residential wastewater) must provide an effluent quality equal to those specified and required as residential wastewater characteristics (See NSF Standard Number 40 Class I and Class II residential influent wastewater characteristics in Table I.) …

Table I. Summary of NSF Standard No. 40 for Aerobic Treatment Units

Performance Designations	Wastewater Characteristics		Required Test Protocol
	Influent	**Effluent**	
NSF[1] Class I	$CBOD_5$: 100 - 300 mg/L [2]	$CBOD_5$: ≤25 mg/L [2] ≤40 mg/L [3]	NSF Std. No. 40[4]
	TSS: 100 - 350 mg/L [2]	TSS: ≤30 mg/L [2] ≤45 mg/L [3]	
	pH: No standard specified	pH: 6.0 - 9.0	
	No bacterial standard specified [5]	No bacterial standard specified [6]	
NSF[1] Class II	$CBOD_5$: 100 - 300 mg/L [2]	$CBOD_5$: Not more than 10% of samples >60 mg/L	NSF Std. No. 40[4]
	TSS: 100 - 350 mg/L [2]	TSS : Not more than 10% of samples > 100 mg/L	
	pH: No standard specified	pH: 6.0 - 9.0	
	No bacterial standard specified [5]	No bacterial standard specified [6]	

[1] NSF – National Sanitation Foundation.
[2] 30-day average.
[3] 7-day average.
[4] NSF *International* Standard for Wastewater Technology / Residential Wastewater Treatment Systems Standard No. 40 – January 1999
[5] For Treatment Standard 1 or 2 listing the 30-day geometric mean of fecal coliform concentration of the wastewater delivered to the system shall be between 6 and 8 log#/100 mL.
[6] For Treatment Standard 1 or 2 listing the 30-day geometric mean of fecal coliform concentrations of effluents samples shall be respectively less than 200 fecal coliform/100 mL or less than 800 fecal coliform/100 mL.

1.2.4. Category 1 ATUs & Treatment Standards 1 & 2—Certain site conditions determine the need for an on-site sewage system meeting Treatment Standard 1 (TS1) or Treatment Standard 2 (TS2) (See Table II). Some Category 1 ATUs exhibit performance characteristics consistent with all, or only two, of the performance parameters for TS1 and TS2. Category 1 ATUs may be used on sites where TS1 or TS2 is required when:

(a) the ATU is included on the current Department of Health list of systems and products that meet TS1 & TS2; and,

(b) disinfection, when used to meet the fecal coliform parameter of TS1 or TS2, is used in a manner consistent with the INTERIM Recommended Standards and Guidance for Disinfection Methods and Equipment, DOH (May, 2000).

Table II. Application of Treatment Standard 1 and 2

Permit Event	Treatment Standard	Applies When & Where
Repair or Replacement	1 or 2	Horizontal separation to a water supply or surface water can not meet the standards for new construction.[1]
New Construction or Expansion	2	Vertical separation is less than 2 feet in Soil Types 1B, 2A&B, 3-6.[2] Development where Soil Type 1A exists.[3]
"Treatment standard 1" means a thirty-day average of less than 10 milligrams per liter of biochemical oxygen demand (5 day BOD_5), 10 milligrams per liter of total suspended solids (TSS), and a thirty-day geometric mean of less than 200 fecal coliform per 100 milliliters.[4] "Treatment standard 2" means a thirty-day average of less than 10 milligrams per liter of biochemical oxygen demand (5 day BOD_5), 10 milligrams per liter of total suspended solids (TSS), and a thirty-day geometric mean of less than 800 fecal coliform per 100 milliliters.[4]		
[1] See Table VI in the SBOH rules WAC 246-272 [2] See Table IV in the SBOH rules WAC 246-272 [3] See Table IV and Table VII in the SBOH rules WAC 246-272 [4] A 30-day average of less than 8.3 mg/L of carbonaceous biochemical oxygen demand (5-day $CBOD_5$) will be accepted in lieu of the BOD_5 value when data are submitted in the course of NSF Standard No. 40 testing and reporting protocols.		

2. Application Standards—

2.1. Listed Products—Only ATUs listed in the current edition of the DOH List of Approved Systems and Products may be permitted by local health jurisdictions for systems within their jurisdiction [WAC 246-272-04001(2)]. Only the specific models listed in the document are approved. If other models in a manufacturer's product-line do not appear on the list, they are not approved for use in Washington State. If in doubt, contact DOH for current listing information.

2.1.1. Category 1 ATUs are reviewed, approved and listed based upon the results of performance testing. ATUs are listed by manufacturer and model. For the purpose of identifying which brands and models qualify for use at sites that require systems meeting Treatment Standards 1 or 2, the maximum 30-day average for BOD_5 and/or $CBOD_5$ (See Table II, Note 4), TSS & 30-day geometric mean for fecal coliform is provided. Although the fecal coliform parameter is not part of the NSF Standard No. 40 testing protocol, the testing of this parameter must include the collection and analysis of influent and effluent grab samples at a minimum frequency of 3 days-per-week, and at the same duration (26 consecutive weeks) and hydraulic loadings (design and stress loadings) as the NSF sample collection requirements for the BOD_5 and/or $CBOD_5$ and TSS parameters**.** The performance information is excerpted from the test results reported by the independent testing entity, consistent with the protocol, such as calendar 30-day averages based on all data points collected (see subsection 1.2.2**).** For Treatment Standard 1 or 2 listing, all testing requirements for each parameter (BOD_5 and/or $CBOD_5$, TSS, and fecal coliform) must be achieved as provided for in NSF Standard No. 40. System performance shall be considered outside the limits established in the Treatment Standards if any 30-day average or geometric mean values during performance testing equals or exceeds the parameter performance limitations of the Treatment Standards.

For system performance testing, the minimum fecal coliform influent and effluent sampling frequency is 3 days a week for 26 consecutive weeks. Prior to product testing, manufacturers should evaluate the risk-benefit of selecting this minimum sampling frequency to save cost over a higher sampling frequency to avoid unnecessary system retesting. To decrease the risk of obtaining testing results that fail to meet the Treatment Standards, manufacturers are encouraged to consider increasing sampling frequency to as much as 5 days a week. Statistical analysis of fecal coliform sampling frequency indicates systems that perform well have a higher chance of failing with less frequent sampling (possibly resulting in testing results with higher 30-day geometric means). Conversely, systems that perform well have a greater chance of passing with more frequent sampling (possibly resulting in testing results with lower 30-day geometric means)..

2.1.2. Category 2 and 3 ATUs are reviewed, approved and listed based upon the results of performance testing (see subsection 1.2.2) in accordance with the test results reporting requirements in Table III below.

Table III. Test Results Reporting Requirements for Proprietary Treatment Products

Treatment Component / Train Category	***Testing Results Reported***
Category 1 Designed to treat typical-strength residential sewage.	Report test results of influent and effluent sampling obtained throughout the testing period (including normal and stress loading periods) for evaluation of constituent reduction for the parameters: $CBOD_5$, and TSS: ❑ Average ❑ Standard Deviation ❑ Minimum ❑ Maximum ❑ Median ❑ Interquartile Range ❑ 30-day Average (for each month) When testing for bacteriological reduction performance, report fecal coliform test results of influent and effluent sampling by geometric mean from samples drawn within 30 day or monthly calendar periods, obtained from a minimum of three samples per week throughout the testing period (including normal and stress loading periods). Test report must also include the individual results of all samples drawn throughout the test period.
Category 2 Designed to treat high-strength non-residential or commercial sewage (such as at restaurants, grocery stores, mini-marts, group homes, medical clinics, etc.)	Report test results of Influent and effluent sampling obtained throughout the testing period (including normal and stress loading periods) for evaluation of constituent reduction for the parameters: $CBOD_5$, FOG and TSS Test report must also include the individual results of all samples drawn throughout the test period.
Category 3 Designed to treat high-strength residential sewage	Report test results of Influent and effluent sampling obtained throughout the testing period (including normal and stress loading periods) for evaluation of constituent reduction for the parameters: $CBOD_5$, and TSS Test report must also include the individual results of all samples drawn throughout the test period.

2.2. Permitting—

2.2.1. An installation permit and, if required, an operational permit must be obtained from the local health jurisdiction before installation of an ATU.

2.2.2. For sites where either Treatment Standard 1 or 2 must be met, some means acceptable to the local health jurisdiction must be implemented to assure proper on-going operation and maintenance (O&M) of the ATU and the remaining system components as long as the facility is served by the on-site sewage system. The following options may be used separately or in combination. Approaches to assuring long-term O&M of ATUs include:

(a) recording the requirement for an on-going service contract on the property deed;

(b) issuing an operating permit (in addition to the initial installation permit), with the requirement for maintaining a service contract; and,

(c) requiring a management entity to provide O&M assurance. Examples of management entities include: cities & towns, public utility districts, water & sewer districts, special-use districts, and corporations and home-owner associations with demonstrated capacity to assure long-term management.

2.2.3. Local health jurisdictions may implement O&M assurance measures (see subsection 2.2.2) for sites other than those where Treatment Standard 1 or 2 is required to be met.

2.3. Influent Characteristics—

2.3.1. Residential Wastewater—

(a) Typical-strength residential wastewater: Category 1 ATUs are listed by DOH for treatment of typical-strength residential wastewater. See Table 1 for a summary of influent and effluent wastewater characteristics used by NSF for testing and certification.

(b) High-strength residential wastewater: Category 3 ATUs are listed by DOH for treatment of high-strength residential wastewater where the level of wastewater constituents (BOD_5, TSS, FOG) are greater than that typically found in residential wastewater. See Table 1 for a summary of influent and effluent wastewater characteristics used by NSF for testing and certification.

2.3.2. High-Strength Non-residential Wastewater: Category 2 ATUs are listed by DOH for treatment of high-strength wastewater from non-residential or commercial sources. These high-strength wastewaters exhibit levels of constituents (BOD_5 TSS, FOG) somewhat greater to dramatically greater than that existing in typical-strength residential wastewater.

2.4. Pre-treatment —Determination of whether or not pre-treatment is needed before an ATU depends on the conditions of brand-specific product testing.

2.4.1. For those ATUs using an external trash tank or septic tank (single or multiple) compartment to pre-treat wastewater during performance testing:

(a) a tank of at least equivalent design and volume capacity is required as a component of the sewage system; and,

(b) a conventional two-compartment septic tank may be used in the place of a single compartment tank, if consistent with the manufacturer's recommendations.

2.4.2. For those ATUs not using an external trash tank or septic tank to pre-treat wastewater during the performance testing, pretreatment is required only when the ATU manufacturer recommends the installation of a pretreatment tank in specific settings or applications. Pretreatment tank size and configuration must be consistent with the manufacturer's recommendation.

2.5. ATU Model / Size Selection—

2.5.1. Residential Wastewater—

(a) Category 1 ATUs (typical-strength residential wastewater applications): follow the manufacturer's recommendation to match the model / size of the ATU with the daily design wastewater flow anticipated from the dwelling.

(b) Category 3 ATUs (high-strength residential wastewater applications): follow the manufacturer's recommendation to match the model / size of the ATU with the daily design wastewater flow and BOD_5, TSS or FOG loading measured from the dwelling.

2.5.2. Non-Residential, Commercial Wastewater—

(a) Category 2 ATUs (high-strength non-residential or commercial wastewater applications): follow the manufacturer's recommendation when matching a model / size of ATU with the daily design wastewater flow and BOD_5, TSS, & FOG loading anticipated.

2.6. Access Ports—

2.6.1. Ground-level access ports must be sized and located to facilitate installation, removal, sampling, examination, maintenance, and servicing of components or compartments that require routine maintenance or inspection. Access ports must be sufficiently sized and located to facilitate:

(a) visually inspecting and removing mechanical or electrical components;

(b) removing components that require periodic cleaning or replacement;

(c) visually inspecting and collecting samples; and,

(d) removing (manual or pumping) accumulated residuals.

2.6.2. Access ports must be protected against unauthorized intrusion. Acceptable protective measures include, but are not limited to, padlocks or covers that can be removed only with tools.

2.7. Failure Sensing and Signaling Equipment—

2.7.1. The ATU must possess a mechanism or process capable of detecting:

(a) failure of electrical and mechanical components that are critical to the treatment process; and,

(b) high liquid level conditions above the normal operating specifications.

2.7.2. The ATU must possess a mechanism or process capable of notifying the system owner of failures identified by failure sensing components identified in subsection 2.8.1. The mechanism must deliver a visible and audible signal in the following manner:

(a) The visual alarm signal must be conspicuous at a distance of 50 feet (15 meters) from the system and its appurtenances.

(b) The audible alarm signal strength must be between 70 and 90 dbA at 5 feet (1.5 meters) and discernible at a distance of 50 feet (15 meters) from the system and its appurtenances.

(c) The visual and auditory signals must continue being functional in the event of electrical, mechanical equipment, or hydraulic malfunction of the system. The audible signal may be disabled for service as long as the visual signal remains active while cause for the alarm is identified and alleviated.

2.7.3. A clearly visible label or plate with instructions for obtaining service must be permanently located near the failure signal.

2.8. Data plate—

2.8.1. The ATU must have permanent and legible data plates located;

(a) on the front of the electrical control box, (only if the ATU has an electrical control box or panel); and,

(b) on the tank, aeration equipment assembly, or riser at a location accessed during maintenance cycles and inspections.

2.8.2. Each data plate must include:

(a) manufacturer's name and address;

(b) model number;

(c) serial number (required on one data plate only);

(d) rated daily hydraulic capacity of the system; and,

(e) the performance expectations as determined by performance testing and evaluation.

2.9. Installation—ATUs must be installed:

2.9.1. according to the manufacturer's instructions in compliance with state and local rules; and,

2.9.2. by an authorized representative of the manufacturer who is approved by the local health jurisdiction.

2.10. Disinfection—Refer to the INTERIM Recommended Standards and Guidance for Disinfection Methods and Equipment, DOH (May, 2000).

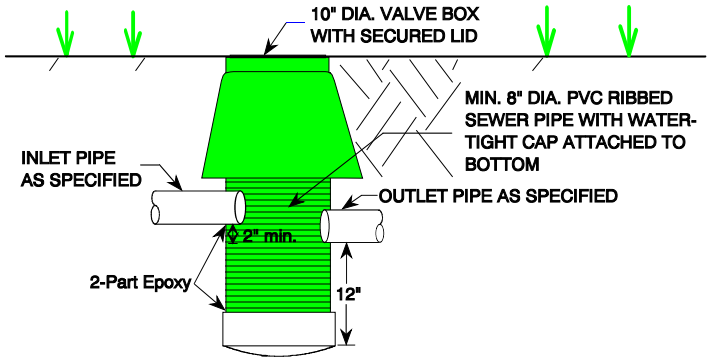
2.11. Sampling Ports—

2.11.1. A Sampling port must be designed, constructed, and installed to provide easy access for collecting a "free fall" water sample from the effluent stream. The sampling port may be located within the ATU or other system component (such as a pump chamber) provided that the wastewater stream being sampled is representative of the effluent stream from the ATU.

Sample ports are installed for diagnostic activities and/or confirming compliance with system performance requirements. Samples are easier to obtain from a pressurized transport lines than gravity flow. Figure 1. illustrates a suggested method to access gravity flow for sample collection.

***Free fall** is a term used to describe wastewater movement where samples should be taken to minimize contamination during collection. If collecting a sample from a discharge port under pressure, the water should be flowing freely and the collection container should not touch any part of the pipe work. When collecting a sample from gravity flow it should be taken from the flow as spill from a weir or drop to minimize possible contamination.*

Figure 1. In-line Sampling Port



2.11.2. For ATUs using effluent disinfection to meet the fecal coliform criteria of either Treatment Standard 1 or 2, the sampling port must be located downstream of the disinfection component (including the contact chamber if chemical disinfection is used) so samples will accurately reflect disinfection performance.

2.11.3. Sampling ports must be protected against unauthorized intrusion. Acceptable protective measures include, but are not limited to, a padlock or cover that can be removed only with tools.

Intermittent Use—*ATUs generally perform better when wastewater-loading patterns are relatively consistent and uniform. This is typically the case for residential wastewater flows. Intermittent use, such as infrequently used recreational facilities, however, may lower overall ATU performance due to repeated "start up" periods. The duration of, and performance levels during, start up varies product-to-product. Operation and maintenance functions performed by qualified service providers can reduce the performance variability caused by intermittent use. This should be considered when selecting the appropriate treatment system option and establishing O&M service schedules and contracts for intermittently used sites.*

2.12. Disposal Component—

2.13.1. Direct discharge of effluent from an ATU to surface water or upon the ground surface is prohibited by WAC 246-272-11501(2)(a). Subsurface disposal is required.

2.13.2. Drainfield design allowances vary according to treatment performance levels. Refer to the Recommended Standards and Guidance for Effluent Quality-Based Drainfields (May, 2000).

2.13.3. The size and design of the disposal component must be consistent with the methods and procedures indicated by WAC 246-272-09001, WAC 246-272-11001 and WAC 246-272-11501.

2.13.4. Disposal component location must meet minimum horizontal setback distances as specified by WAC 246-272-09501, and 246-272-16501.

2.13.5. Development using ATUs must meet the minimum land area requirements specified in WAC 246-272-20501.

3. Design—

3.1. ATUs are exclusively proprietary products representing a wide variety of designs, materials used, and methods of assembly. As such, there are no specific recommended standards for the design of ATUs.

4. Operation & Maintenance Standards—

4.1. General—

4.1.1. The owner of the residence or facility served by the ATU is responsible for assuring proper operation and providing timely maintenance of the ATU and all other components of the on-site wastewater treatment and disposal system.

4.1.2. The authorized representative for the ATU must instruct, or assure that instruction regarding proper operation of the ATU is provided to, the owner of the residence or facility.

4.1.3. The on-site wastewater system designer must instruct, or assure that instruction is provided to, the owner of the residence or facility regarding proper operation of the entire on-site wastewater system. This instruction should emphasize operating and maintaining the entire on-site wastewater system within the parameter ranges for which it is designed

4.1.4. Conditions in the drainfield must be observed and recorded by the service provider during all operation and maintenance activities for the ATU and other system components. These observations must be reported to the local health jurisdiction responsible for permitting the system in a manner that is consistent with the local permit and operation & maintenance requirements.

If observations reveal a drainfield failure (defined by WAC 246-272-01001), or history of long-term, continuous and increasing effluent ponding within the drainfield, which if left unresolved will result in failure, the owner of the system must take appropriate action, according to the direction and satisfaction of the local health jurisdiction to alleviate the situation. Any repair, or modification activity must be reported as part of the monitoring activity for the site. Appropriate actions may include:

(a) repairing or modifying the drainfield system (Local permits must be obtained before construction begins according to local health jurisdiction requirements for repairs);

(b) pertaining to reduced-size drainfields, enlarging the drainfield system area to initial design size required by WAC 246-272 (Local permits must be obtained before construction begins according to local health jurisdiction requirements.); or,

(c) modifying the wastewater strength and/or quantity from the structure served.

4.1.5. A Service Contract for on-going service and maintenance of the entire wastewater system, as described in sections 4.7 of this standard, is required. The service and maintenance requirements may be modified by the local health jurisdiction, but as a minimum continued service and maintenance must be addressed for the life of the system by an operation plan.

The O&M Service Contract is the common vehicle by which the ATU industry assures satisfactory long-term operation of aerobic treatment systems. Each new unit purchase customarily comes with the initial 2-year service contract included in the purchase price. To help assure that system owners continue the contract relationship with a qualified service provider, the ATU industry generally encourages local permitting agencies to stipulate the requirement for an on-going service contract as one of the permit requirements. Such a requirement alone may encourage ATU owners to renew service contracts. But for others, it places the local permitting agency in the role of "contract enforcement".

Other approaches to assuring long-term O&M of ATUs include:

☑ recording the requirement for an on-going service contract on the property deed;
☑ issuing an Operating Permit (in addition to the initial installation permit), with the requirement for maintaining a service contract; or
☑ requiring a management entity to provide O&M assurance. Examples of management entities include: cities & towns, public utility districts, water & sewer districts, special-use districts, and corporations and home-owner associations with demonstrated capacity to assure long-term management.

All ATUs need servicing consistent with the product manufacturer's recommendations to assure long-term system performance. Where ATU performance is being relied upon to provide public health and environmental protection on marginal sites (limited vertical separation, size, and soil-treatment potential), local permitting agencies are encouraged to identify and implement O&M assurance management elements appropriate for their jurisdictions.

4.2. Limited warranty—

4.2.1. The ATU manufacturer must:

(a) warrant all components of the ATU to be free from defects in material and workmanship for a minimum of 2 years from the date of installation; and

(b) fulfill the terms of the warranty by repairing or exchanging any components that, in the manufacturer's judgment, show evidence of defect.

4.3. Owner's manual—

4.3.1. The on-site wastewater system designer must (for each on-site wastewater system using an ATU) develop / assemble an accompanying comprehensive owner's manual. The manual may be a collection of individual system component manuals. This document must include:

(a) system installation manual;

(b) operation and maintenance manual;

(c) troubleshooting and repair manual; and

(d) as-built plans with the name and contact number of the engineer/designer and installer.

4.3.2. The authorized ATU representative must provide a manufacturer-prepared manual to the wastewater system designer, the system owner and, if requested, to the local health jurisdiction at the time of system installation. The information in this manual(s) must be presented in a manner which can be easily understood by the owner and include, at a minimum:

(a) a parts list which includes all primary functional components, equipment manufacturer(s) and model designations;

(b) a statement designating current classification of the ATU as NSF Class I or II, and its approval listing rating by the Department of Health;

(c) a statement of product performance demonstrated during testing;

(d) a statement regarding the use of pre-treatment with the ATU, including whether or not a pre-treatment tank was used during product testing and any application-specific recommendations for using pre-treatment tanks.

(e) a functional description of how the process functions, including diagrams which illustrate basic system design and flow-path;

(f) a clear statement which provides examples of the types of waste that can be effectively treated by the system;

(g) a list of household substances that, if discharged into the system could adversely affect system performance or groundwater quality;

(h) comprehensive operating instructions that clearly delineate proper function of the system, operating and maintenance responsibilities of the owner and authorized service personnel, and service-related obligations of the manufacturer(s);

(i) requirements for periodic removal of residuals from the system;

(j) a course of action to be taken if the system is subjected to electrical power interruption beyond 48 hours;

(k) a course of action to be applied if the system will be used intermittently or if extended periods of non-use are anticipated;

(l) detailed methods and criteria for identifying system malfunction or problems;

(m) a statement instructing the owner to reference the ATU data plate in the event that a problem is identified or service obligations related to the ATU needs to be met by the manufacturer;

(n) the name and telephone number of a service representative to be contacted in the event that the system experiences a problem;

(o) a description of the initial and extended service policies as stated in Section 4.7;

(p) electrical schematics for the system if not appearing as a permanent attachment on the system; and,

(q) emergency contact numbers for service providers, pumpers and local health.

4.4. Installation manual—

4.4.1. The ATU manufacturer, and manufacturers of other components of the system must provide comprehensive and detailed installation instructions to:

(a) authorized representatives;

(b) the wastewater system designer and/or installer; and,

(c) the local health jurisdiction upon request.

4.4.2. The installation manual must be written to be easily understood by the installer and include, at a minimum:

(a) a numbered parts list of system components with accompanying illustration, photographs, or prints in which the components are respectively identified;

(b) design, construction, and material specifications, for the system's components;

(c) schematic drawings of the system's electrical components;

(d) off-loading and unpacking instructions which include:
- ☑ safety considerations;
- ☑ identification of fragile components, and
- ☑ measures to avoid damaging the system;

(e) a process overview which explains the function of each component and a description of how the entire system functions when all components are properly assembled and connected;

(f) a clear description of installation requirements for, but not limited to plumbing and electrical power, ventilation, air intake protection, bedding, hydrostatic displacement protection (floating in high ground water conditions), water tightness, slope, and miscellaneous fittings and appurtenances;

(g) a sequential installation procedure from the residence out to the effluent discharge connection;

(h) repair or replacement instructions in the event that a system possesses flaws that would inhibit proper functioning with a list of sources where replacement components can be obtained; and,

(i) a detailed start-up procedure.

4.5. Operation and maintenance manual—

4.5.1. The ATU manufacturer must provide comprehensive and detailed operation and maintenance instructions to authorized representatives and, if requested to the local health jurisdiction. The operation and maintenance manual(s) must be written so as to be easily understood by the owner and O&M service provider and include as a minimum:

(a) a maintenance schedule for all critical components;

(b) requirements and recommended procedures for periodic removal of residuals from the system;

(c) a detailed procedure for visually evaluating function of system components;

(d) a description of olfactory and visual techniques for confirming correct process parameters (i.e. mixed liquor concentration and biomass health) and system performance;

(e) a recommended method for collecting and transporting effluent samples;

(f) the effluent quality parameters expected to be produced by a properly operating system as established through analytical methods described or referenced by NSF Standard 40; and,

(g) safety concerns that may need to be addressed.

4.5.2. The manufacturer of other components of the on-site system must make available to the wastewater system designer and/or installer, documentation similar to that described by 4.5.1.

4.6. Trouble shooting and repair manual—

4.6.1. ATU manufacturers must provide comprehensive and detailed troubleshooting and repair instructions to authorized representatives and, if requested, the local health jurisdiction. The manual(s) must be written so as to be easily understood by the intended reader and must include, at a minimum:

(a) a guide for evaluating the system and narrowing the scope of problems based on internal process conditions, effluent parameters, characteristics, system operation, and history;

(b) a sequential method for isolating specific component failure; and,

(c) a step-by-step guide for repairing or replacing all components of the system.

4.6.2. The manufacturer of other components of the on-site system must make available to the wastewater system designer and/or installer, documentation similar to that described by 4.6.1.

4.7. Service-related obligations—

4.7.1. The entire on-site wastewater treatment and disposal system with an ATU must be assured proper O&M through an initial and renewed service contract for the life of the system or other means approved by the local health jurisdiction. A single service contract and service provider for both the ATU and the other components is preferable to multiple contracts for service providers.

4.7.2. A 2-year initial service policy must be furnished to the owner by the ATU manufacturer or authorized representative with the following conditions:

(a) cost of the initial service policy must be included with the original purchase price of the ATU;

(b) the initial service policy must contain provisions for four inspection/service visits (scheduled once every 6 months over the 2-year period) during which electrical, mechanical, and other applicable components are inspected, adjusted, and serviced;

(c) the initial service policy must contain provisions for an ATU effluent quality inspection consisting of a visual assessment for color, turbidity, and scum overflow, an olfactory assessment for odor, and any other performance assessment / operational diagnosis, including sampling of treated effluent (post-disinfection if disinfection is used) required by the local health jurisdiction; and,

(d) the initial service policy must contain a clause stating that the owner must be notified, in writing, about any improper system function that cannot be remedied during the time of inspection, and the written notification must include an estimated date of correction by the manufacturer or their representative.

4.7.3. Service providers must maintain accurate records of their service contracts, customers, performance data, and time lines for renewing the contracts. These records must be available for inspection upon request by the local health jurisdiction. The local health jurisdiction may require copies of these records to be submitted to the local health agency responsible for permitting the system.

4.7.4. A manufacturer or authorized representative must make available, for purchase by the owner, an extended service polic*y* with terms comparable to those of the initial service policy, which includes O&M service for the entire on-site wastewater system, not just the ATU. The service provider must notify the local health jurisdiction of service contracts that are not renewed.

4.7.5. In the event that a mechanical or electrical component of the ATU requires off-site repair, the local authorized representative must maintain a stock of mechanical and electrical components that can be temporarily installed until repairs are completed if repairs are expected to render the unit inoperable for longer than 48 hours.

4.7.6. Emergency service must be available within 48 hours of a service request.

4.7.7. The ATU service provider must possess adequate knowledge and skill regarding on-site wastewater treatment, effluent disposal concepts and system function. The service provider must be:

(a) product-certified by each manufacturer for any ATUs they intend to service;

(b) able to provide documentation of product certification as evidence upon request; and,

(c) able to demonstrate competency in the servicing (Operation & Maintenance) of on-site sewage systems.

Completion of a course of instruction at the Northwest On-Site Wastewater Training Center / Puyallup, Washington, or other equivalent training facility may be most useful to the O&M professional. Completion of such courses as Basics of Operation, Maintenance, and Monitoring may help develop the knowledge and skills needed to provide appropriate O&M to the wide range of on-site sewage systems needing routine servicing.

4.7.8. O&M service contracts establish the initial and on-going relationship between the O&M service provider and system owner. The service provider may be the ATU manufacturer / service representative or the system owner. The contract must identify the roles and responsibilities assigned to the service provider. The specifics of O&M service contracts may vary product-to-product and locality-to-locality, but all O&M service contracts must include information / conditions of agreement such as:

(a) owner's name & address;

(b) property address & legal description;

(c) local health jurisdiction permit requirements;

(d) specific contacts / owner address, service provider, and local health jurisdiction;

(e) detail of service to be provided;

(f) schedule of service provider duties;

(g) cost and length of service contract / time period;

(h) details of product warranty;

(i) owner's responsibilities / under the contract and routine operation of the wastewater treatment and disposal system;

(j) document recording, such as notification to the mortgage-holder or attachment to the deed of trust; and,

(k) document verification / notary public.

4.7.9. O&M service record keeping and reports required for the local health jurisdiction must specify:

(a) what data is to be reported;

(b) to whom the reports are to be submitted;

(c) the format for presenting information; and,

(d) the frequency of reporting.

Appendix A

Monitoring: Impact of Site Limitations and System Complexity—

The monitoring frequency and level of detail information reported relates to limitations presented by site conditions and system complexity. Monitoring and reporting to assure proper function becomes increasingly critical for more vulnerable sites and/or complex systems. This concept, which is applied to all conventional and alternative on-site sewage treatment systems, is illustrated by Tables A and B which may be used to guide decisions related to monitoring and reporting.

Table A.
Relationship Between Site Limitations and System Complexity for Conventional and Alternative On-Site Sewage Treatment Systems

Issue	Characteristics / Level of Limitation and Complexity		
	Lower ← ← ← ← ← ← ← ← ← ← ← ←	→ → → → → → → → → → → → **Higher**	
Site Limitation	Meets state rules for *conventional gravity system*	Meets state rules for *conventional pressure distribution system*	**Limitation increases with -** *less* vertical separation, smaller lot sizes, less horizontal separation, and, *greater* surface slope, wastewater flow, wastewater strength, etc.
System Complexity	Gravity-flow (no pumps, controls, etc.)	Pressurized distribution (requires pumps & controls)	**Complexity increases with -** *increasing* reliance upon, or combinations of: pumps; blowers; motors; mechanical, electronic, or computer-operated controls & warning devices; disinfection (materials & equipment); reduction in drainfield size; quality control of artificial (non-original soil) treatment media, etc.

Table B.
Suggested Monitoring Frequency Based Upon Site Limitations and System Complexity for Conventional and Alternative On-Site Sewage Treatment Systems

	Level			
Site Limitation	Low	Low	High	High
System Complexity	Low	High	Low	High
Monitoring Frequency	***Low = Annually***	***Medium = Semi-annually***		***High = Quarterly, or greater***

Appendix B

GLOSSARY OF TERMS—

Term	*Meaning / Description*
Alternative System	An on-site sewage system other than a conventional gravity system or conventional pressure distribution system. Properly installed and maintained alternative systems provide equivalent or enhanced treatment performance as compared to conventional gravity systems.
Approved	A written statement of acceptability, issued by the Department of Health
Approved List	"List of Approved Systems and Products", developed annually and maintained by the department and containing the following: (a) List of proprietary devices approved by the department; (b) List of specific systems meeting Treatment Standard 1 and Treatment Standard 2; (c) List of experimental systems approved by the department; (d) List of septic tanks, pump chambers, and holding tanks approved by the department.
Approved Testing Facility	An ANSI accredited testing facility, or other third-party testing facility approved by the Department of Health.
ATU—Aerobic Treatment Unit	"Aerobic treatment devices are basically containers of various configurations that provide for aerobic biodegradation or decomposition of the wastewater components by bringing the wastewater in contact with air by some mechanical means." (TRC, July 1984)
Biochemical Oxygen Demand (BOD_5)	A test, which measures the molecular oxygen, used by microorganisms during a five-day incubation period at a temperature of 20^0C (68^0F) for the biochemical degradation of organic material (CARBONACEOUS DEMAND), and the oxygen used by microorganisms to oxidize inorganic material such as sulfides and ferrous iron. It also may measure the amount of oxygen used to oxidize reduced forms of nitrogen such as ammonia and organic nitrogen (NITROGENOUS DEMAND) if the microorganisms capable of mediating the reaction are present in the sample. .
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	Same as the 5-day biochemical oxygen demand (BOD_5) test, except that the NITROGENOUS DEMAND is prevented by addition of an inhibitory chemical to the sample.
Coliform (Bacteria)	A group of bacteria that produce gas and ferment lactose, some of which are found in the intestinal tract of warm-blooded animals. They are indicators of potential ground water and/or surface water contamination with such fecal material. The coliform group of organisms includes all of the aerobic and facultative anaerobic, gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35^o C.
Conventional Gravity System	An on-site sewage system consisting of a septic tank and a subsurface soil absorption system with gravity flow distribution of the effluent.
Conventional Pressure Distribution System	An on-site sewage system consisting of a septic tank and a subsurface soil absorption system with pressure distribution of the effluent.
Designer	See Licensed On-site Sewage System Designer
Disposal Component	A subsurface absorption system (SSAS) or other soil absorption system receiving septic tank or other pretreatment device and transmitting it into original, undisturbed soil.
Dosing Tank / Chamber	A tank which collects treated effluent and periodically discharges it into another treatment / disposal component, depending upon the needs and design of the particular on-site sewage system.
Drainfield (Conventional)	An area in which perforated piping is laid in drain rock-packed trenches, or excavations (seepage beds) for the purpose of distributing the effluent from a wastewater treatment unit into original, undisturbed soil.
Effluent	Liquid, which is discharged from an on-site sewage system component, such as a septic tank (septic tank effluent) or sand filter (sand filter effluent).
Engineer	See Licensed Professional Engineer
Failure	A condition of an on-site sewage system that threatens the public health by inadequately treating sewage or creating a potential for direct or indirect contact between sewage and the public. Examples of failure include: (a) sewage on the surface of the ground; (b) sewage backing up into a structure caused by slow absorption of septic tank effluent; (c) sewage leaking from a septic tank, pump chamber, holding tank, or collection system; (d) cesspool or seepage pits where evidence of ground water or surface water quality degradation exists; or (e) inadequately treated effluent contaminating ground water or surface water.

Term	*Meaning / Description*
	(f) noncompliance with standards stipulated on the permit.
Fats, Oils & Greases (Fog)	FOG is a measure of the amount of fatty matter from animal and vegetable sources and hydrocarbons from petroleum products and waxes, such as from lotions, shampoos, and tanning oils. High levels of fats, oils and greases in the wastewater stream may interfere with wastewater treatment efficiency.
Fecal Coliform (Bacteria)	Coliform bacteria specifically originating from the intestines of warm-blooded animals, used as a potential indicator of ground water and/or surface water pollution.
Influent	Wastewater, partially or completely treated, or in its natural state (raw wastewater), flowing into a reservoir, tank, treatment unit, or disposal unit.
Licensed On-Site Sewage System Designer	A person licensed by the Washington State Department of Licensing to match site and soil characteristics with appropriate on-site sewage technology.
Licensed Professional Engineer	A person licensed by the Washington State Department of Licensing as a professional engineer consistent with Chapter 18.43, RCW.
On-Site Sewage System	An integrated arrangement of components for a residence, building, industrial establishment or other places not connected to a public sewer system which: (a) Convey, store, treat, and/or provide subsurface soil treatment and disposal on the property where it originates, upon adjacent or nearby property; and (b) Includes piping, treatment devices, other accessories, and soil underlying the disposal component of the initial and reserve areas.
Pressure Distribution	A system of small diameter pipes that apply effluent fairly uniformly over the entire absorption area, as described in the "Recommended Standards and Guidance for Pressure Distribution Systems" by the Washington State Department of Health. (See Conventional Pressure Distribution System.)
Proprietary Device Or Method	A device or method classified as an alternative system, or a component thereof, held under a patent, trademark or copyright.
Pump Chamber	A tank or compartment following the septic tank or other pretreatment process which contains a pump, floats and volume for storage of effluent. In timer-controlled pressure distribution systems, this is frequently called a "surge tank" or "equalization tank." If a siphon is used, in lieu of a pump, this is called a "siphon chamber."
Raw Wastewater	Wastewater before it receives any treatment.
Residential Sewage	Sewage having the consistency and strength typical of wastewater from domestic households.
Routine Servicing	Servicing all system components as needed, including product manufacturer's requirements / recommendations for service.
Septic Tank	A water tight pretreatment receptacle receiving the discharge of sewage from a building sewer or sewers, designed and constructed to permit separation of settleable and floating solids from the liquid, detention and anaerobic/facultative digestion of the organic matter, prior to discharge of the liquid.
Service Interval	The time period between planned site visits to perform various system monitoring functions such as checking equipment, renewing depleted disinfectant chemical supply, and collecting samples. The service intervals may be specified by contracts, operation plans, or local health jurisdiction permits.
Sewage	Any urine, feces, and the water carrying human wastes including kitchen, bath, and laundry wastes from residences, building, industrial establishments or other places. For the purposes of this document, "sewage" is generally synonymous with domestic wastewater. Also see "residential sewage."
Subsurface Soil Absorption System - "SSAS"	A system of trenches three feet or less in width, or beds between three feet and ten feet in width, containing distribution pipe within a layer of clean gravel designed and installed in original, undisturbed soil for the purpose of receiving effluent and transmitting it into the soil.
Total Suspended Solids (TSS)	Suspended solids refer to the dispersed particulate matter in a wastewater sample that may be retained by a filter medium. Suspended solids may include both settleable and unsettleable solids of both inorganic and organic origin. This parameter is widely used to monitor the performance of the various stages of wastewater treatment, often used in conjunction with BOD5 to describe wastewater strength. The test consists of filtering a known volume of sample through a weighed filter membrane that is then dried and re-weighed.
Treatment Component	A class of on-site sewage system components that modify and/or treat sewage or effluent prior to the effluent being transmitted to another treatment component or a disposal component. Treatment occurs by a variety of physical, chemical, and/or biological means. Constituents of sewage or effluent may be removed or reduced in concentrations.

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